

APPENDIX 5-22

CRANDALL CANYON MINE SITE RECLAMATION PLAN

CRANDALL CANYON MINE SITE RECLAMATION PLAN

Phase 1

The reclamation of the disturbed areas of the Crandall Canyon mine site is described in outline and detail below. This description is based upon discussions in the text of Chapters 2, 3, 4, 5, 7 which address the regulations regarding reclamation requirements. In the interest of clarity, the following discussion describes the reclamation process in terms of several general areas within the mine yard. Refer to Figure 1 in this Appendix. Within each of these general areas, reclamation will follow a general sequence of 1) demolition, 2) backfilling, grading and topsoil application, 3) reclamation and revegetation. However, in practice, reclamation will be performed in several of these areas simultaneously. **The final step, reclamation and revegetation, for all the areas will not be done until the fall.**

Following Phase 1 reclamation, the only structures to remain will be the sedimentation pond and associated spillway and discharge structure as well as the conveyance ditches, berms and culverts necessary to route drainage to the pond. Refer to Plates 5-16 and 7-5 for location of these structures.

Genwal recognizes that development of a feasible reclamation plan for final reclamation of the expansion area containing the best available reclamation methodology is an essential part of this permitting process. Therefore, Genwal has contacted consultants with revegetation and reclamation experience to gather together the best reclamation techniques for reclamation of the steep-slope area. JBR Environmental Consultants, who has had prior experience with reclamation in difficult areas, has provided a letter detailing reclamation methodology that they believe will contribute to the successful reclamation of this area. This letter, included as Attachment 1, was written in response to Genwal's discussions held with JBR as the reclamation plan was being revised. Genwal feels that incorporation of the various reclamation techniques that JBR has identified as being successful in past situations will greatly enhance the success of this reclamation effort. Genwal also recognizes that in the time between now and when final reclamation is actually done, technology may evolve new and better reclamation ideas. Genwal commits to modifying the reclamation plan prior to final reclamation should better reclamation products and methodology become available. This reclamation plan will be reviewed prior to implementation to incorporate applicable methodology and techniques which are considered best technology currently available (BTCA) at the time of reclamation.

Area Descriptions

The reclamation plan has been divided into several general areas for the purpose of explanation. It is likely that reclamation efforts will occur in multiple areas during the same time interval. These areas are depicted on Figure 1 and described in summary below.

Portal Area: The Portal Area consists of an inclined access road, the mine portals leading into the underground mine, and structures in this area.

Expansion Area: In 1997, the surface facilities will have been expanded to the area south of the Forest Service road by culverting approximately 1,500' of Crandall Canyon through a 72" bypass culvert. Earthen fill material will have been trucked in to construct the Expansion Area. The truck loadout facilities will have been relocated to the Expansion Area along with the Overhead Conveyor, Stacking tube, Reclaim Tunnel and Conveyor, Crusher Building, MCC Building, Substation, and other associated structures. The fill from the Expansion Area will be utilized during final reclamation to restore approximate original contour in areas of cuts and highwalls. This fill will consist of 8" x 0" earth and rock material obtained from an approved off-site borrow area.

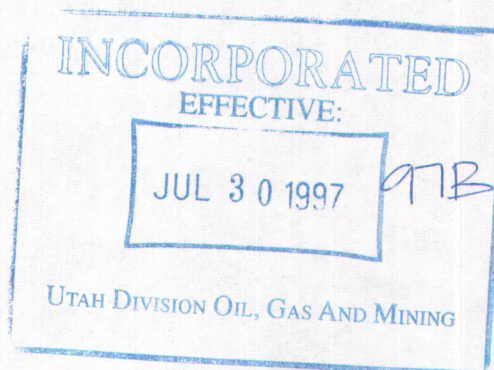
The Expansion Area has been divided into a North Slope Expansion Area and South Slope Expansion Area for the purposes of the reclamation discussion. The North Slope Expansion Area is that area north of the existing Crandall Creek and south of the existing Forest Service road. The South Slope Expansion Area includes the steeper hillside located south of the existing Crandall Creek. Due to the steep slopes encountered on the South Slope, special reclamation procedures have been prescribed for this area. Much of the reclamation plan designed for the South Slope is based on input from reclamation specialists who have experience in steep-slope reclamation situations.

Old Substation Area: The Old Substation Area the pad that was originally constructed in the northern part of the mine yard above the shop for a substation. However, the substation was never constructed at this location. Other than an existing powerline, there are no facilities on this site to be removed and the area has had interim revegetation.

Old Loadout Area: The Old Loadout Area is located adjacent to and just north of the Forest Service road and the new loadout. This is the area where coal was previously stockpiled and loaded into trucks prior to construction of the 1997 expansion area.

Forest Service Road: The Forest Service Road runs east-west through the mine site. The road is to be kept in place following reclamation activities but will undergo a change in width.

Shop Area: The Shop Area is located west of the mine portal area and north of the Forest Service Road. Facilities to be removed from the Shop area include: Shop/Warehouse building, Substation, Rock Dust Bin, Oil Shed and parking lot asphalt.



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RECLAMATION PLAN OUTLINE

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1. Demolition and Removal of Surface Facilities - Portal Area
2. Removal and Disposal of Expansion Area Fill Material inside Mine Portals
3. Seal and Backfill Portals
4. Backfill, Grade and Topsoil - Portal Area
5. Revegetation - Portal Area
6. Demolition - Old Substation Area
7. Backfill, Grade and Topsoil - Old Substation Area
8. Revegetation - Old Substation Area
9. Demolition and Removal of Surface Facilities - Shop Area
10. Backfill, Grade and Topsoil - Shop Area
11. Revegetation - Shop Area
12. Demolition and Removal of Surface Facilities - Old Loadout Area
13. Backfill, Grade and Topsoil - Old Loadout Area
14. Revegetate - Old Loadout Area
15. Reclaim Forest Service Road North of Expansion Area
16. Demolition and Removal of Surface Facilities - Expansion Area
17. Removal of Fill Material and Recontouring - Expansion Area
18. Restoration of South and North Hillside Slopes - Expansion Area
19. Revegetation - South Slope of Expansion Area
20. Removal and Disposal of 72" Culvert
21. Topsoiling - North Slope of the Expansion Area
22. Revegetation - North Slope of the Expansion Area
23. Restoration of the Stream Channel
24. Revegetation of the Stream Channel
25. Sediment Control and Treatment
26. Topsoil Stockpile Reclamation
27. Phase 2 Reclamation

Note: A Reclamation Timetable has been provided at the end of this discussion.

RECLAMATION PLAN DETAIL

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1. Demolition and Removal of Surface Facilities - Portal Area

When mining operations have been permanently ceased and the portals and surface facilities are no longer needed to support the mine, all buildings and other structures will be dismantled and hauled off site to an approved landfill. Reusable materials will be salvaged and recycled to the extent possible.

At the Portal Area, facilities to be removed are: underground bath house, mine fan, fan transformer (portable), belt transfer station, guard rail at top and along access road, water pipelines, and the diversion culvert above portals.

The existing shotcrete above the portal road, above the portals and above the old coal loadout area, along with wire mesh, clips and other similar materials will be removed and disposed of in an appropriate state approved landfill.

All combustible materials will be removed from the underground bathhouse and hauled to an approved solid waste landfill. Any structures that would interfere with sealing of the portals, such as beltline structure, would also be removed.

Equipment used in the demolition and disposal of the facilities include: a front end loader, a backhoe, highway end dump trucks, a trackhoe, a crane, truck with flat bed trailer, oxy-acetylene torches, air compressor and power tools, etc.

2. Removal and Disposal of Expansion Area Fill Material inside Mine Portals

At the same time the structures in the portal area are being demolished and removed, the other surface facility structures located on the Expansion Area (truck loadout, conveyors, crusher building, etc.) will also be removed. After the removal of these structures from the Expansion Area, excess fill material from this area will be taken inside the mine entries for permanent placement [note: reclamation of the Expansion Area is described in greater detail later in this plan]. Fill material, in excess of that needed for backfilling the Portal Area, Shop Area and Old Loadout Area (an estimated 20,410 loose cubic yards, Table 5-20-10 in Appendix 5-20) will be loaded, hauled and disposed of underground in the mine workings (see Figure 1 in Appendix 5-20 for the disposal area in the mine workings.)

The equipment used in the performance of this step would be a l-h-d unit (scoop), dozer w/ripper, and a front end loader.

3. Seal and Backfill Portals

Upon the completion of the disposal of the excess Expansion Area fill material in the mine workings, the portals will be sealed and backfilled. The four portals on the north side are: bath house entrance, intake air entry, belt entry and fan (return air) entry. The three portals on the south side are the intake, belt and fan entries. The seals will be constructed approximately 25-35 feet inby from the portal openings and will be built according to MSHA regulations. Equipment necessary for sealing would be a cement mixer and hand tools. After finishing the construction of the seals, the 25 to 35 feet of entry from the portals to the seals will be backfilled with additional fill material from the Expansion Area.

4. Backfill, Grade and Topsoil - Portal Area

Once the portals have been sealed and backfilled, reclamation work can then commence on the Portal Area. This work consists of backfilling the cuts to approximate original contour, placing topsoil on the backfilled area and seeding the topsoiled area. Since the Portal Area (and the associated access road) is on a slope, this work will be done in short segments starting at the eastern-most (upper-most) portion of the area and working westward across the portal area and thence down the access road to the Shop Area. Fill material from the Expansion Area will be utilized to backfill and reclaim the highwall area. The fill material will contain rock fragments of all sizes, including a significant amount of 6" to 8" rock fragments. These rocks will assist in providing slope stability and aid revegetation by helping to retain moisture. The fill material will be topped with 12" of topsoil material to promote plant growth.

Mobile heavy equipment will be utilized to move and place fill in highwall and yard areas and the south portal pocket cuts. A front end loader and end dumps will be used to remove fill material from the Expansion Area and haul the material up to the Portal Area. The lifts will be built up horizontally with a slight slope on each lift toward the highwall. Material will be spread into lifts of 18 to 24 inches deep. The loader will compact each lift as the next lift is put in. A backhoe will be used to place and compact the final lift. Before placing topsoil on the final backfilled surface, that surface will be roughened with the backhoe bucket. This will help prevent slippage of the topsoil layer and promote root penetration.

Genwal has committed to adding nutrients as determined by laboratory analysis conducted on topsoil samples taken before topsoil redistribution and during final reclamation. The method used to ensure adequate and representative samples from different locations and depths within the topsoil stockpile include: taking two soil samples per stockpile and collecting samples with a soil auger at two foot increments. Samples of the undisturbed soil adjacent to the regraded site will also be taken for a baseline chemical reference. **Fertilizer will be added to the redistributed topsoil, prior to seeding, if a need is indicated by laboratory results. The fertilizer will be spread on the redistributed topsoil and either disked or hand-raked into the soil (depending on the steepness of the slope).**

Areas to receive topsoil will be marked with stakes indicating the depth of application. A
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reclamation supervisor will oversee the topsoil redistribution operation. Topsoil will be left in a roughened condition prior to seeding to minimize compaction and erosion as well as promote infiltration of precipitation.

5. Revegetation - Portal Area

Revegetation procedures for the Portal Area and the south portal pocket cuts involves a **four step program: 1) application of fertilizer (if laboratory testing indicates a need), 2) hydroseed, 3) hydromulch the entire area with a wood fiber mulch to stabilize soil during vegetative growth and control runoff, 4) plant containerized stock to further stabilize the soil and provide vegetative diversity. Hydroseeding will combine the tackifier and small amount of mulch with the seed mix (to mark the area of coverage) during application to the redistributed topsoil.** All seed utilized on the site will be certified pure live seed. After the seeding step, the mulch (wood fiber and hay/straw) and tackifier will be applied to the seedbed surface. The plant containerized stock will be planted in the second year of reclamation. **Revegetation work will not be done until fall (September-October).**

6. Demolition - Old Substation Area

The only structures existing at the Old Substation Area is the termination structure for the mine powerline. This powerline will be dismantled and removed from the site prior to completion of final reclamation.

7. Backfill, Grade and Topsoil - Old Substation Area

As excess fill from the Expansion Area is placed in the underground mine workings, additional fill from the Expansion Area will be hauled to the Old Substation Area for backfilling. The cut slope above the pad will be backfilled to the approximate original contour. The area will then be topsoiled and revegetated.

Genwal has committed to adding nutrients as determined by laboratory analysis conducted on topsoil samples taken before topsoil redistribution and during final reclamation. The method used to ensure adequate and representative samples from different locations and depths within the topsoil stockpile include: taking two soil samples per stockpile and collecting samples with a soil auger at two foot increments. Samples of the undisturbed soil adjacent to the regraded site will also be taken for a baseline chemical reference. Fertilizer will be added to the redistributed topsoil as indicated by laboratory results of the most needful increment.

The areas to be topsoiled will be marked with stakes indicating the depth of application. A reclamation supervisor will oversee the topsoil redistribution operation. Topsoil will be left in a roughened condition prior to seeding to minimize compaction and erosion as well as promote infiltration of precipitation.

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8. Revegetation - Old Substation Area

Revegetation procedures for the Old Substation Area involves a **four step** program: 1) **application of fertilizer (if laboratory testing indicates a need)**, 2) hydroseed, 3) hydromulch the entire area with a wood fiber mulch to stabilize soil during vegetative growth and control runoff, 4) plant containerized stock to further stabilize the soil and provide vegetative diversity. **Hydroseeding will combine the tackifier and small amount of mulch with the seed mix (to mark the area of coverage) during application to the redistributed topsoil.** All seed utilized on the site will be certified pure live seed. After the seeding step, the mulch (wood fiber and hay/straw) and tackifier will be applied to the seedbed surface. The plant containerized stock will be planted in the second year of reclamation. **Revegetation work will not be done until fall (September-October).**

9. Demolition and Removal of Surface Facilities - Shop Area

Facilities to be removed from the Shop area include: Shop/Warehouse building, Substation, Rock Dust Bin, Oil Shed and parking lot asphalt. All structures will be removed from the site. Some components will be salvaged and recycled. Non-salvageable material will be disposed of in an approved solid waste landfill. All asphalt removed from the site will be disposed on in an approved RCRA disposal site.

A portion of the retaining wall which separates the Shop Area from the Forest Service Road will be removed, loaded onto trucks and hauled to an approved landfill. That portion not removed will be buried under a minimum of four feet of backfill material.

Equipment used in the demolition and disposal of the facilities include: a front end loader, a backhoe, highway end dump trucks, a trackhoe, crane, truck with flat bed trailer, oxy-acetylene torches, air compressor and power tools, etc.

10. Backfill, Grade and Topsoil - Shop Area

With the Portal Area and Old Substation Area reclamation completed, and the retaining wall removed, the reclamation activities can continue at the Shop Area. Although this area is not as steep as the previous areas, the same reclamation procedures will be used. The cut slope behind the shop will be backfilled to approximate original contour using fill material from the Expansion Area. The lifts will be built up horizontally with a slight incline on each lift toward the existing cut slope. The dozer/loader will spread the material in lifts of 18 to 24 inches deep. The mobile equipment will compact each lift as the next lift is put in. Near the top of the slope, a backhoe will be used to place and compact the final lift. Before placing topsoil on the final backfilled surface, the surface will be roughened with the backhoe bucket to prevent slippage of the topsoil layer and promote root penetration.

Genwal has committed to adding nutrients as determined by laboratory analysis

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conducted on topsoil samples taken before topsoil redistribution and during final reclamation. The method used to ensure adequate and representative samples from different locations and depths within the topsoil stockpile include: taking two soil samples per stockpile and collecting samples with a soil auger at two foot increments. Samples of the undisturbed soil adjacent to the regraded site will also be taken for a baseline chemical reference. Fertilizer will be added to the redistributed topsoil as indicated by laboratory results of the most needful increment.

The areas to be topsoiled will be marked with stakes indicating the depth of application. A reclamation supervisor will oversee the topsoil redistribution operation. Topsoil will be left in a roughened condition prior to seeding to minimize compaction and erosion as well as promote infiltration of precipitation.

11. Revegetation - Shop Area

Revegetation procedures for the Shop Area involves a **four step** program: 1) **application of fertilizer (if laboratory testing indicates a need)**, 2) hydroseed, 3) hydromulch the entire area with a wood fiber mulch to stabilize soil during vegetative growth and control runoff, 4) plant containerized stock to further stabilize the soil and provide vegetative diversity. **Hydroseeding will combine the tackifier and small amount of mulch with the seed mix (to mark the area of coverage) during application to the redistributed topsoil.** All seed utilized on the site will be certified pure live seed. After the seeding step, the mulch (wood fiber and hay/straw) and tackifier will be applied to the seedbed surface. The plant containerized stock will be planted in the second year of reclamation. **Revegetation work will not be done until fall (September-October).**

12. Demolition and Removal of Surface Facilities - Old Loadout Area

At the time of final reclamation, the facilities at the Old Loadout Area will have already been removed and disposed of as part of the 1997 Surface Expansion Project. All asphalt removed from the site will be disposed on in an approved RCRA disposal site. A portion of the existing coal pile retaining wall will be removed, loaded onto trucks and hauled to an approved landfill. That portion not removed will be buried under a minimum of four feet of backfill material.

Equipment used in the demolition and disposal of the facilities include: a front end loader, a backhoe, highway end dump trucks, a trackhoe, crane, and truck with flat bed trailer.

13. Backfill, Grade and Topsoil - Old Loadout Area

With the retaining wall removed, reclamation activities can continue at the Old Loadout Area. The same reclamation procedures will be used as described previously. The cut slope behind the retaining wall will be backfilled to approximate original contour using fill material

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from the Expansion Area. The lifts will be built up horizontally with a slight incline on each lift toward the existing cut slope. The dozer/loader will spread the material in lifts of 18 to 24 inches deep. The mobile equipment will compact each lift as the next lift is put in. Near the top of the slope, a backhoe will be used to place and compact the final lift. Before placing topsoil on the final backfilled surface, the surface will be roughened with the backhoe bucket to prevent slippage of the topsoil layer and promote root penetration.

Genwal has committed to adding nutrients as determined by laboratory analysis conducted on topsoil samples taken before topsoil redistribution and during final reclamation. The method used to ensure adequate and representative samples from different locations and depths within the topsoil stockpile include: taking two soil samples per stockpile and collecting samples with a soil auger at two foot increments. Samples of the undisturbed soil adjacent to the regraded site will also be taken for a baseline chemical reference. Fertilizer will be added to the redistributed topsoil as indicated by laboratory results of the most needful increment.

The areas to be topsoiled will be marked with stakes indicating the depth of application. A reclamation supervisor will oversee the topsoil redistribution operation. Topsoil will be left in a roughened condition prior to seeding to minimize compaction and erosion as well as promote infiltration of precipitation.

14. Revegetation - Old Loadout Area

Revegetation procedures for the Old Loadout Area involves a **four step** program: 1) **application of fertilizer (if laboratory testing indicates a need)**, 2) hydroseed, 3) hydromulch the entire area with a wood fiber mulch to stabilize soil during vegetative growth and control runoff, 4) plant containerized stock to further stabilize the soil and provide vegetative diversity. **Hydroseeding will combine the tackifier and small amount of mulch with the seed mix (to mark the area of coverage) during application to the redistributed topsoil.** All seed utilized on the site will be certified pure live seed. After the seeding step, the mulch (wood fiber and hay/straw) and tackifier will be applied to the seedbed surface. The plant containerized stock will be planted in the second year of reclamation. **Revegetation work will not be done until fall (September-October).**

15. Reclaim Forest Service Road North of Expansion Area

The Forest Service road from the trailhead/turnaround will be reclaimed according to the Special Use Permit. As stipulated in the existing Forest Service special use permit (8/26/89) covering the road, during final reclamation the width of the asphalt road surface within the permit area will be reduced from a 27 foot subgrade and 22 foot running surface to a 20 foot subgrade and 14 foot running surface. Asphalt removed from the permit area as part of this road narrowing will be taken to a approved RCRA disposal site. The reclaimed area will be topsoiled and revegetated as described above.

Based on recent correspondence, the Forest Service now indicates that it prefers to have the asphalt totally removed from the road surface upon final reclamation. This position differs from the stipulations of the existing Forest Service Special Use Permit that requires that a 14' asphalt running surface be left in place upon final reclamation. Genwal commits to reclaiming the road through the minesite to any standard desired by the Forest Service at the time of final reclamation. At the present time, however, it is difficult for Genwal to commit to a reclamation standard for the road that is contrary to the existing Forest Service Special Use Permit.

16. Demolition and Removal of Surface Facilities - Expansion Area

The facilities to be removed from the Expansion Area are: the overhead conveyor, stacking tube, reclaim vault and tunnel/escapeway tube, crusher building, MCC building, loadout conveyor, truck loadout and loading platform. Removal of these facilities will take place simultaneously with removal of facilities from the aforementioned areas. After these surface facilities are removed, the only structures that will remain will be the sedimentation pond and associated spillway and discharge structure as well as the conveyance ditches, berms and culverts necessary to route drainage to the pond. Refer to Plates 5-16 and 7-5 for location of these structures.

Equipment used in the demolition and disposal of the facilities include: a front end loader, a backhoe, highway end dump trucks, a trackhoe, a crane, truck with flat bed trailer, oxy-acetylene torches, air compressor and power tools, etc.

17. Removal of Fill Material and Recontouring - Expansion Area

Reclamation of the Expansion Area (which includes the south portal access ramp) is different from the other reclaimed areas because restoration of the approximate original contour involves removal of fill material rather than placement of backfill material. As described in the preceding sections, fill material removed from the Expansion Area will be used to regrade and restore approximate original contour at the Portal Area, Old Substation Area, Shop Area, and the Old Loadout Area. Therefore, these reclamation operations will be accomplished simultaneously. Expansion Area fill that is not slated for use as backfill for the aforementioned areas (i.e. excess fill) will be disposed of in the underground mine workings as described previously.

Reclamation of the Expansion Area involves three separate procedures involving three separate areas: the North Slope of the Expansion Area, the Crandall Creek Channel Area, and the South Slope of the Expansion Area. As described previously, the North Slope Expansion Area is that area north of the existing Crandall Creek and south of the existing Forest Service road. The South Slope Expansion Area includes the steeper hillside located south of the existing Crandall Creek and the south portal area. The Crandall Creek Channel Area is the area within and immediately on either side of the existing creek channel.

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Reclamation of the North Slope Expansion Area will follow the normal reclamation procedures described above for the other general areas (i.e. regrading, topsoiling and revegetation). Reclamation on the steeper than normal slopes of the South Slope Expansion Area will involve a different reclamation technique which is designed to revitalize the existing left-in-place topsoil. Reclamation of the Crandall Creek Channel Area is also designed to revitalize the existing left-in-place topsoil and restore the previous channel morphology.

18. Restoration of South and North Hillside Slopes - Expansion Area

Five years prior to beginning reclamation operations, Genwal will consult with the Division to re-evaluate the techniques and practices being proposed for the Expansion Area. This consultation will include forming a task force of members with various areas of reclamation expertise to review the reclamation plan and recommend the best and most suitable reclamation techniques and products available at that time. The review and consultation will re-assess and revise, where needed, the existing reclamation plan to provide the best and most appropriate reclamation measures for the site.

At the time of final reclamation, all surface facilities located on the Expansion Area pad will be disassembled and removed from the site. In the area of the (then removed) coal stockpile, all coal will be removed from the small adjacent slope area where the south flank of the coal pile had previously rested. Prior to reclaiming this area, all coal fines will be vacuumed from the surface. Using the existing pad as a work surface, a 12" layer of topsoil will then be reapplied to the disturbed area. Areas to receive topsoil will be marked with stakes indicating the depth of application. A reclamation supervisor will oversee the topsoil redistribution operation. Topsoil will be left in a roughened condition prior to seeding to minimize compaction and erosion as well as promote infiltration of precipitation.

Genwal has committed to adding nutrients as determined by laboratory analysis conducted on topsoil samples taken before topsoil redistribution and during final reclamation. The method used to ensure adequate and representative samples from different locations and depths within the topsoil stockpile include: taking two soil samples per stockpile and collecting samples with a soil auger at two foot increments. Samples of the undisturbed soil adjacent to the regraded site will also be taken for a baseline chemical reference. Fertilizer will be added to the redistributed topsoil, prior to seeding, if a need is indicated by laboratory results. The fertilizer will be spread on the redistributed topsoil and hand-raked into the soil.

Revegetation procedures for this area will involve a four step program: 1) application of fertilizer (if laboratory testing indicates a need), 2) hydroseed, 3) hydromulch the entire area with a wood fiber mulch to stabilize soil during vegetative growth and control runoff, 4) plant containerized stock to further stabilize the soil and provide vegetative diversity. Hydroseeding will combine the tackifier and small amount of mulch with the seed mix (to mark the area of coverage) during application to the redistributed topsoil. All seed utilized on the site will be certified pure live seed. After the seeding step, the mulch (wood fiber and hay/straw) and tackifier will be applied to the seedbed surface. The plant containerized stock

will be planted in the second year of reclamation.

Following the surface facility demolition activities, fill material will be removed from the Expansion Area in approximately 5'-10' lifts. During the fill removal process, the culvert inlet structure will be left in place on the west end of the yard to continue the diversion of water through the 72" culvert. A 40 foot wide berm will be left intact at the culvert inlet to continue to serve as the culvert headwall and to continue to divert water into the 72" culvert.

The sequence for removing the fill material, culvert, and underdrain system from the Expansion Area will be essentially the same as during the 1997 construction process but in reverse order. (See construction details in Appendix 7-50).

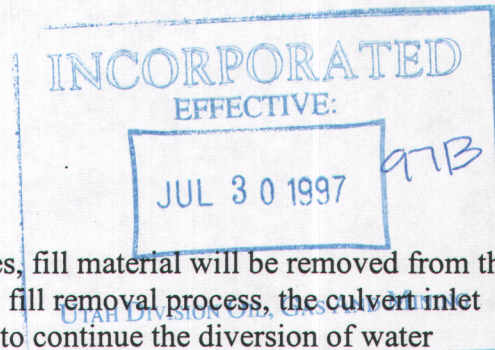
Fill will be removed from the Expansion Area in 5'-10' lifts starting from the west end of the yard and proceeding to the east end. At the intersection of the South Slope and the pad fill the marker soil/geotextile fabric will be located. The marker soil will be carefully removed from on top of the geotextile fabric on the South Slope as the yard fill is being removed. This will allow reclamation to be done on vertical increments of the hillside that will be easy to access from the adjacent yard level. Removal of fill material adjacent to the South Slope will be done very carefully in order not to disturb the in-place soil resources. Fill removal in this area will be done with small earth-moving equipment (Bobcats, backhoes, etc.) and/or by hand if necessary in order to minimize disturbance of the topsoil. Once the geotextile fabric has been exposed, the fabric will be carefully peeled away from the soil and the condition of the underlying soil materials observed at this time. The soil will be reclaimed and revegetated in 5-10 foot horizontal zones that can be easily accessed and worked by hand from the adjacent pad fill level. After each level has been reclaimed as described below, another lift (5-10 feet of fill) will be removed from the fill. Revegetation work will continue on the next increment of hillside below the previously reclaimed level. This work will be done in continued successive lifts, involving fill removal, peeling away the geotextile, revitalization of the in-place topsoil, and revegetation of the newly exposed increment.

It should be noted that approximate original contour of the North Slope of the Expansion Area will also be re-established as the Expansion Area fill is being removed in lifts as described previously. As the fill is being removed in vertical lifts, the adjacent North Slope surface will be regraded and prepared for subsequent topsoil application.

Sediment control during fill excavation will be met by continued use of the sediment pond east and downstream from the yard area. The main 72" culvert inlet and an adequate amount of fill to maintain the existing headwall will be left intact during this phase of the fill retrieval process.

19. Revegetation - South Slope of the Expansion Area

Reclamation of the South Slope will take place in vertical increments (lifts) simultaneously with the removal of the fill material in corresponding lifts. As fill lifts are being



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removed, the adjacent newly exposed hillside will be reclaimed and revegetated.

It is anticipated that after the Expansion Area fill is removed in lifts and the geotextile fabric is peeled away in vertical increments, the underlying soil material could be somewhat compacted. To enhance the ability of the soil to absorb moisture, a mixture of PAM (Polyacrylamide) or best technology currently available at the time of reclamation, will be applied to the soil surface. PAM is designed to relieve compaction of the soil and open up channels for air and water penetration. This treatment will be applied in successive 5-10' lifts as the fill is removed and the hillside is exposed.

The re-exposed soil structure will most likely be undamaged but lacking in microbes and nutrients. In order to regenerate naturally existing soil organisms and assist in reactivating soil activity, an inoculum will be applied to the soil to reestablish soil bacteria, microhorizia and mycelium. To enhance soil microbial establishment and promote more rapid stabilization of the soil the non-riparian seed mixture (as listed in Appendix 3-6) will be hand broadcast over the area and raked into the soil surface. A wood fiber mulch will be applied over the seed bed then the surface will be sprayed with a bonded fiber matrix tackifier. This type of tackifier has appeared to have a much greater ability than regular tackifier to hold and stabilize the soil surface. The bonded fiber matrix tackifier will be applied at a rate of 3,500 pounds per acre (or manufacturer's recommended application if greater).

By removing the fill in 5'-10' lifts and simultaneously reclaiming the adjacent South Slope in corresponding lifts, the pad area can then serve as convenient operating platform for the machinery and supplies used during the reclamation effort. In this manner heavy machinery will not be required to maneuver on the steep slopes. All reclamation work performed directly on the steep slopes will be done with hand labor and tools. The reclamation process will be supported by heavy equipment staged on the adjacent pad level.

20. Removal and Disposal of 72" Culvert

During the 1997 construction of the expanded surface facilities, the creek channel configuration was left intact throughout the entire length of the Expansion Area. This was accomplished by covered the channel in situ with a geotextile fabric during initial construction period. The geotextile was placed over the channel to preserve the indigenous soil and morphology of the existing creek bed. The fabric was placed along the bottom and 5 feet above the channel embankment. A colored marker material was placed on top of the geotextile to serve as a visual marker horizon during reclamation operations.

Fill removal (and South Slope reclamation) will proceed vertical lifts until the 72" culvert has been exposed. Prior to removing the culvert, the stream flow will be diverted into the 18" underdrain system by removing the cap from the drain pipe located at the upstream end of the culvert. This will be done during a low flow period of the year, such as July or August. Once the streamflow has been successfully diverted into the underdrain system, removal of the 72" culvert can begin. Removal of the culvert will be done in 20' segments starting from the

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upstream end and working downstream. All culvert material will be removed from the site and disposed of in an approved landfill. The remaining culvert bedding material (2" x 0" gravel), which is located on top of the underdrain system, will be left in place at this time to provide a stable work area for heavy equipment involved in subsequent reclamation of the North Slope as described later in this discussion.

The 72" culvert will be removed downstream to an elevation just above the sediment pond. At this time, a new culvert inlet and headwall will be re-established for the remaining 72" culvert segment. The headwall will be rebuilt at this location according to original headwall design and will be rip rapped in a similar manner. At this stage of the reclamation process, approximately 1,100' of 72" culvert will have been removed and approximately 400' still remains in place below and around the left-in-place sediment pond. However, stream flow will still continue to flow temporarily through the underdrain system at this time until the North Slope reclamation has been completed.

21. Topsoiling - North Slope of the Expansion Area

After the Expansion Area fill and the 72" culvert have been removed, the underdrain system will still remain intact. Because this phase of work will be done during low flow, the stream will be adequately carried through the underdrain system. Mobile earthmoving equipment will still be able to operate on top of the 2" x 0" bedding material located over the underdrain system. Reclamation of the North Slope, which is not as steep as the south slope, will be done with the standard protocol for reclamation involving topsoiling and revegetation.

Topsoil will be reapplied to the North Slope in the conventional manner. Topsoil will be hauled in by truck and spread with a front end loader and/or backhoe. Areas to receive topsoil will be marked with stakes indicating the depth of application. A reclamation supervisor will oversee the topsoil redistribution operation. Topsoil will be left in a roughened condition prior to seeding to minimize compaction and erosion as well as promote infiltration of precipitation.

Genwal has committed to adding nutrients as determined by laboratory analysis conducted on topsoil samples taken before topsoil redistribution and during final reclamation. The method used to ensure adequate and representative samples from different locations and depths within the topsoil stockpile include: taking two soil samples per stockpile and collecting samples with a soil auger at two foot increments. Samples of the undisturbed soil adjacent to the regraded site will also be taken for a baseline chemical reference. Fertilizer will be added to the redistributed topsoil as indicated by laboratory results.

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22. Revegetation - North Slope of the Expansion Area

Revegetation procedures for the North Slope of the Expansion Area involves a **four step** program: **1) application of fertilizer (if laboratory testing indicates a need), 2) hydroseed, 3) hydromulch the entire area with a wood fiber mulch to stabilize soil during vegetative growth and control runoff, 4) plant containerized stock to further stabilize the soil and provide vegetative diversity. Hydroseeding will combine the tackifier and small amount of mulch with the seed mix (to mark the area of coverage) during application to the redistributed topsoil.** All seed utilized on the site will be certified pure live seed. After the seeding step, the mulch (wood fiber and hay/straw) and tackifier will be applied to the seedbed surface. The plant containerized stock will be planted in the second year of reclamation. **Revegetation work will not be done until fall (September-October).**

23. Restoration of the Stream Channel

After the north slope has been topsoiled, the underdrain system will then be removed and the stream channel morphology restored. Prior to removal of the underdrain, silt fences will be established in Crandall Creek downstream from the existing 72" culvert outlet. These silt fences will be located in an area convenient for maintenance and cleanout.

Removal of the underdrain system will be done during low flow conditions and will be completed in reverse order from the way it was originally installed. Using small mobile equipment, such as a backhoe, the remaining culvert bedding material, drain rock and 18" drain pipe will be removed in 20' segments starting from the upper end and working downstream. After the drain rock and drain pipe are removed, the lower layer of geotextile can be carefully peeled back, re-establishing the "natural" streambed in the process. All drain rock, drain pipe and geotextile material removed during this process will be disposed of at an approved landfill. As each 20' segment of the underdrain system is removed, silt fencing will be installed on either side of the newly restored stream channel. The purpose of this silt fencing is to treat drainage from the adjacent recently reclaimed areas.

After the underdrain system has been removed and the stream channel re-established downstream past UD-1, a rip rapped ditchway will be installed to carry drainage from the side culvert outlet down the North Slope to the restored stream channel. Refer to Plate 5-16.

The underdrain system will be removed downstream to an elevation just above the sediment pond at the location of the new 72" culvert inlet and headwall. At this time, the remaining 18" drain pipe will be recapped and the stream flow redirected back into the 72" culvert. [Note: this new sediment pond/culvert/underdrain configuration will remain in place until Phase 2 reclamation, as described later]. At this stage of the reclamation process, approximately 1,100' of 72" culvert and underdrain system will have been removed and approximately 400' will still remain in place to divert channel flow below and around the left-in-place sediment pond.

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24. Revegetation of the Stream Channel

It is anticipated that after the underdrain system is removed and the geotextile fabric is peeled away, the underlying soil material along the stream banks will be somewhat compacted. To enhance the ability of the soil to absorb moisture, a mixture of PAM (Polyacrylamide) or best technology currently available at the time of reclamation, will be applied to the soil surface. PAM is designed to relieve compaction of the soil and open up channels for air and water penetration.

The re-exposed soil structure will most likely be undamaged but lacking in microbes and nutrients. In order to regenerate naturally existing soil organisms and assist in reactivating soil activity, an inoculum will be applied to the soil to reestablish soil bacteria, microhorizia and mycelium. To enhance soil microbial establishment and promote more rapid stabilization of the soil, the riparian seed mixture (as listed in Appendix 3-6) will be hand broadcast over the area and raked into the soil surface. A wood fiber mulch will be applied over the seed bed then the surface will be sprayed with a bonded fiber matrix tackifier. This type of tackifier has appeared to have a much greater ability than regular tackifier to hold and stabilize the soil surface. The bonded fiber matrix tackifier will be applied at a rate of 3,500 pounds per acre (or manufacturer's recommended application if greater).

25. Sediment Control and Treatment

In practice, many of the reclamation procedures outlined above will be conducted simultaneously. However, the sediment pond will provide complete sediment control during all phases of the reclamation process until such time as the upper 1,100' segment of 72" culvert has been removed and removal of the underdrain system begins. Sediment control during removal of the underdrain will consist of silt fences constructed on either side of the newly restored stream channel and silt fences constructed within Crandall Creek below the outlet of the 72" culvert.

26. Topsoil Stockpile Location Reclamation

Following the removal of the topsoil stockpiles from the storage sites (during final reclamation retopsoiling activities), the topsoil pile locations will be reclaimed. (Enough topsoil will remain stockpiled for Phase 2 reclamation. Refer to the Phase 2 reclamation discussion in item #27 below.) The topsoil stockpile locations will not require soil redistribution since the native topsoil is still in place. At these locations, the ground will be lightly scarified and then reclaimed according to the standard reclamation protocol.

Revegetation procedures for the stockpile locations will involve a **four step** program: 1) **application of fertilizer (if laboratory testing indicates a need)**, 2) hydroseed, 3) hydromulch the entire area with a wood fiber mulch to stabilize soil during vegetative growth and control runoff, 4) plant containerized stock to further stabilize the soil and provide vegetative diversity. **Hydroseeding will combine the tackifier and small amount of mulch with the seed mix (to**

mark the area of coverage) during application to the redistributed topsoil. All seed utilized on the site will be certified pure live seed. After the seeding step, the mulch (wood fiber and hay/straw) and tackifier will be applied to the seedbed surface. The plant containerized stock will be planted in the second year of reclamation. **Revegetation work will not be done until fall (September-October).**

Phase 2

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27. Phase 2 Reclamation - Removal of Sedimentation Pond

During Phase 2 reclamation, prior to any earthwork activity, silt fences will be installed across the entire length of the downstream at the east end of the sediment pond embankment to filter any sediment resulting from removal of the pond. Additional silt fences will be installed in Crandall Creek below the culvert outlet to provide additional sediment control.

Removal of the sediment pond and the remaining 72" culvert/underdrain system will follow the same procedures described previously for the removal of the expansion area fill. The pond embankment will be removed in lifts down to the 72" pipe. Reclamation (grading, topsoiling and revegetation) of the North and South Slopes will be done in the same manner as described for the Expansion Area in Phase 1 reclamation. After the 72" culvert has been exposed the end cap will be removed from the 18" drain pipe located in the underdrain system. Flow will then be diverted through the underdrain system in the drain rock below the 72" pipe. The 72" pipe will be completely removed at this time.

After the 72" pipe has been completely removed, the geotextile fabric will be removed from the top of the underdrain system. The drain rock and 18" drain pipe will be removed with a small backhoe and hauled off-site for disposal. The drain rock beneath the drain pipe will be shoveled out of the channel and the geotextile that was placed over the original channel will be removed by hand, restoring the original stream channel morphology. The disturbed area will be revegetated in the manner previously described for the previously reclaimed areas. In many ways Phase 2 reclamation of the sediment pond embankment will be nearly identical to the Expansion Area reclamation described previously for Phase 1. Both areas involve the steeper South Slope, the stream channel culvert/underdrain system, and the less steep North Slope. Therefore, all pertinent aspects of reclamation which apply to Phase 1 as described in this appendix will also apply to Phase 2. This includes the special steep-slope reclamation techniques for the South Slope, the left-in-place soil revitalization for the channel area, and the standard reclamation procedures for the North Slope.

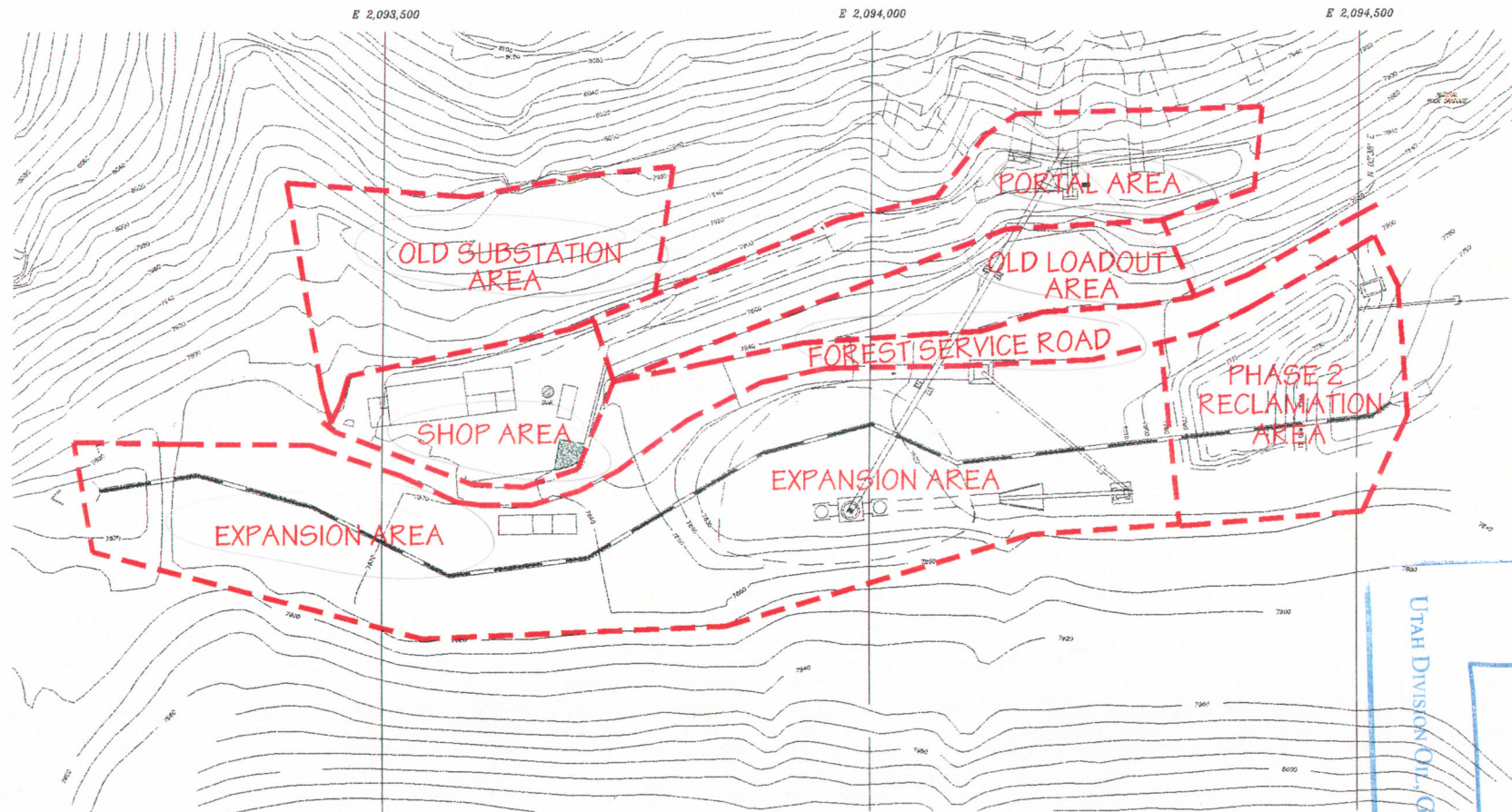


FIGURE 1
CRANDALL CANYON MINE RECLAMATION AREAS

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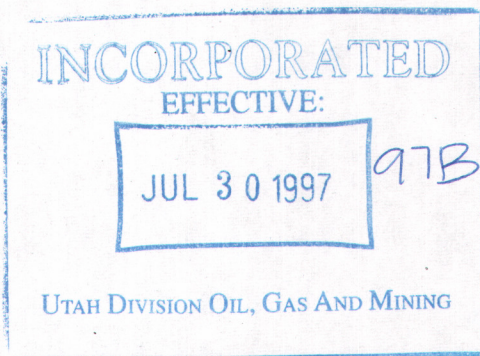
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WK3 WK4

RECLAMATION OPERATION	MAY				JUNE				JULY				AUGUST				SEPTEMBER				OCTOBER			
	WK1	WK2	WK3	WK4	WK1	WK2	WK3	WK4	WK1	WK2	WK3	WK4	WK1	WK2	WK3	WK4	WK1	WK2	WK3	WK4	WK1	WK2	WK3	WK4
PORTAL AREA																								
Remove structures																								
Remove asphalt																								
Haul earthfill into mine workings																								
Seal portals																								
Backfill, regrade, recontour																								
Topsoil																								
Seeding/mulching																								
OLD SUBSTATION AREA																								
Remove structures																								
Backfill/regrade/recontour																								
Topsoil																								
Seeding/mulching																								
OLD SHOP																								
Remove structures																								
Remove asphalt																								
Backfill/regrade/recontour																								
Topsoil																								
Seeding/mulching																								
OLD LOADOUT AREA																								
Remove structures																								
Remove asphalt																								
Backfill/regrade/recontour																								
Topsoil																								
Seeding/mulching																								
FOREST SERVICE ROAD																								
Remove asphalt																								
Topsoil																								
Seeding/mulching																								
EXPANSION AREA - NORTH SIDE																								
Remove structures																								
Remove asphalt (if any)																								
Remove fill (haul to mine workings)																								
Re-establish drainage ditches and rip rap																								
Topsoil																								
Seeding/mulching																								
EXPANSION AREA - SOUTH SIDE																								
Remove structures																								
Remove asphalt (if any)																								
Remove fill (haul to mine workings)																								
Remove marker material, geotextile																								
Revitalize existing topsoil																								
Seeding/mulching																								
EXPANSION AREA - STREAM CHANNEL																								
Remove 72" CMP																								
Remove underdrain and geotextile																								
Revitalize existing topsoil																								

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ATTACHMENT 1

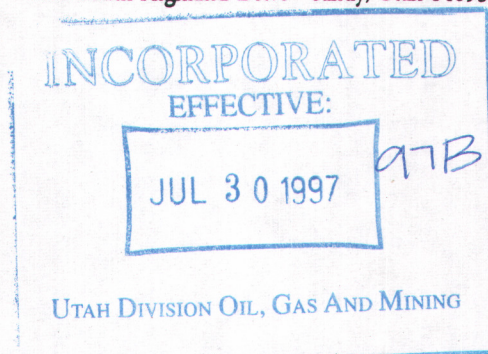
JBR ENVIRONMENTAL CONSULTANTS, INC.
RECLAMATION RECOMMENDATION LETTER



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Jean M. Semborski
Andalex Resources Inc.
Project Engineer
P.O. Box 902
Price, UT 84501



May 22, 1997

RE: Crandall Canyon Culvert Reclamation Plan ACT/015/032

Dear Ms. Semborski:

This is to your request of May 16, 1997 regarding the reclamation plans for the site of Genwal's proposed fill and culvert in Crandall Canyon. Based on our discussions, and my review of your reclamation plan on May 15, 1997, I believe the main topics of interest in the proposed reclamation plan are:

- 1) The existing soil horizon in the canyon that would be covered by the fill will be removed from the surface environment for a number of years as well as being compacted to various degrees by the overlying fill. Extended burial of the soil may affect its density by compaction and may reduce the viability of the soil micro fauna by compaction and reduction of oxygen.
- 2) The north-facing slope under the fill is steep and erosion may be a problem if normal, mechanized seedbed preparation (scarifying and gouging) is conducted which disturbs the soil and may make it more prone to erosion.
- 3) Use of sewage sludge or chemical fertilizer to amend the soil must be done carefully or it may result in contamination of the adjacent stream.
- 4) Prevention of erosion of the soil after seeding is important because of the nearby stream channel.

My general recommendation is that Genwal should propose to reclaim the subject slope in sections as it is being exhumed from under the fill. It is my understanding that the fill will be removed in lifts to allow careful removal of the marker soil and geotextile. This will allow convenient access to all areas of the treated slope from the adjacent fill surface as the fill elevation is gradually reduced.

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The seedbed preparation and seeding should be done with hand labor using hand rakes to lightly scarify the top inch or so of the soil surface, broadcast seed and fertilizer. This light hand work will produce a suitable seedbed for the seed and will thoroughly allow incorporation of the fertilizer into the seedbed. The hand raking should not be so deep as to destabilize the overall soil horizon.

Material such as polyacrylamide (PAM) can be added to the soil to chemically open up the soil for air and water penetration. However, I do not think that the compacted density of the soil immediately after it is exhumed should be much of a hindrance to long-term revegetation success. First of all, most of the soil will be buried under less than the full height of the fill thus the degree of compaction will not be uniform. The soil on the upper portions of the slope will be much less compacted than the soil at the bottom of the slope. Secondly, assuming that the reclamation and reseeding is done in the fall, the soil will be loosened over the winter and early spring by the effects of the weather before germination of the seeds. I would expect the combined effects of frost heave, moisture penetration, and burrowing animals during that first fall, winter, and early spring to naturally mitigate much of the original compacted density.

Erosion control material should be applied after preparation of the seedbed is completed. Hydraulically applied fiber mulch with tackifier and/or bonded fiber matrix should be effective in controlling erosion and may be more cost effective than stapled fiber matting.

With regard to the potential lack of viability of the soil because of its burial, I am not sure that this effect will materially affect the potential revegetation success, using the methods described above. I am familiar with successful revegetation of disturbed mining surfaces where there is no topsoil present. I am aware of materials such as mill tailings, waste rock, alluvium, road base, and heap leach waste that have been successfully revegetated without application of topsoil. These materials are typically enhanced with the use of fertilizer to help support the initial vegetation growth. In these cases, the material used as growth medium did not have the soil micro-fauna typically associated with topsoil, yet the vegetation became well established with chemical fertilizer addition. I have also observed many highway road cut sites where the seedbed was recently exhumed from its previous burial under significant overburden and these slopes have subsequently been revegetated.

In my experience, the main limitations to successful revegetation are lack of suitable soil texture, inadequate chemical nutrients in the growth material, and lack of moisture. In your case, the initial soil texture (gradation) should be unchanged by the burial. Lack of nutrients in the exhumed soil could be determined with sampling and mitigated with chemical fertilizer but its application would have to be carefully planned and carried out to reduce the potential for contamination of the nearby stream from the fertilizer. The location of the soil in question on a north-facing slope at higher elevations should indicate that sufficient moisture for vegetation growth is likely.

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The micro-fauna of the topsoil in question at the Crandall Canyon site may be reduced in numbers and diversity by burial but the soil should still possess suitable gradation, chemical nutrient content and moisture for the above-described reasons. This material should therefore provide a suitable growth material for revegetation. The compacted soil may benefit from use of a mycorrhizal inoculum but even this may not be necessary for the initial establishment of a vegetation cover. The soil micro-fauna will eventually be naturally re-established by the affects of the growing vegetation and exposure to the surface environment. This may be accelerated up with use of a suitable cover crop.

I believe that future revegetation of the slope in question at the Crandall Canyon site should be readily feasible if the recommendations contained in this letter are followed.

Thank you for calling on JBR to assist you with this project. Please call if you have any questions on my recommendations.

Best Regards,



Brian W. Buck
Vice President